Version 7/8/1999 – Comments added

MEETING NOTES--LHC INNERTRIPLET FEEDBOX INTERFACE REVIEW

Monday 28 June 1999
Building 71 Conference Room
Lawrence Berkeley National Laboratory

Attendees: Mike Knolls (LBL), Mike Lamm (FNAL), Tom Nicol (FNAL), Tom Peterson (FNAL, notes), Steve Plate (BNL), Bill Turner (LBL), K. C. Wu (BNL), Jon Zbasnik (LBL)

General comments.

The meeting was more of a discussion than a review and was very useful.

We discussed third versus first angle projections on drawings. LBL is using third angle, but CERN asked BNL to use first angle projection. *LBL will check CERN's preference.*

We have not yet resolved how to carry the vacuum loads on components. Bracing components against one-another, such as the Tevatron does with tie-rods, will be necessary if the alignment and jacking system are not compatible with transferring the loads to the floor. Compressive members between components for carrying these loads may have an effect on alignment and will be another interface issue. *Fermilab will discuss with CERN how CERN carries vacuum loads in other locations in LHC.*

Bus expansion loops will be in the magnets and for both Q3 and D1 include material contraction from the center of the DFBX to the interface, which is about 2.4 meters.

LBL will look into the CERN vacuum connection design for details which can be used on the DFBX, such as O-ring and flange details.

CERN's present plan for magnet thermometry seems to be to add a sensor to the cold mass assembly under the magnet skin, at approximately the center of the magnet. This sensor will be used for control of magnet cooling and due to its importance is presumably actually two redundant sensors. *Fermilab will contact CERN about their providing these thermometers and confirm the preferred location within the cold masses.* Wires for these sensors will pass through the interconnects within the pressurized superfluid space to the DFBX.

Shield bridge pieces will be provided by BNL for D1 and by FNAL for Q3.

There was no agreement on the installation of a liquid level sensor and heater in the "phase separator", really just an overflow collection vessel, at the downhill end of the bayonet heat exchangers. BNL reports that Rob Van Weelderen said the liquid level sensor and heater are not necessary, but some of us question that decision. *Fermilab will discuss the need for a liquid level sensor and heater with CERN.*

There are no liquid level sensors in the cold masses (i.e., in the pressurized superfluid space for checking filling). Temperature sensors, as presently planned for the cold masses and piping, will be sufficient to monitor fill and cooldown.

Wire connections in the interconnects are presently assumed to be soldered, as opposed to mechanical connectors.

Q3 to DFBX interface.

LBL will create separate drawings for IR1R and IR5L and also for IR1L and IR5R. Although the cross-sections look the same for each of these pair of locations, the X-axis positive direction is different.

The XB and LD pipe locations shown on LBL drawing 24C2986 and the other cross-sections are reversed relative to the cryostat positions. *LBL will switch these line locations.*

Pipe locations in the cross-sections shown on LBL drawings 24C2986 and the other drawings do not exactly match Fermilab cryostat cross-sections. *LBL will adjust pipe locations to match.*

Fermilab needs to look at the Q3 end detail for each of the 8 locations. Where no phase separator is required in the DFBX at the Q3 end (i.e., where the Q3 end of the triplet is uphill), the heat exchanger can be capped off at the interconnect rather than continuing into the DFBX. Just a liquid supply tube would extend through the interconnect. However, we would like to add this cap as part of the interconnect assembly, so that the Q3's are the same until installation.

The upper cold mass port, previously called M3 on LBL drawing 24C2986 and the other cross-section drawings, will not pass through the interconnect between Q3 and DFBX. It must be left open for heat transfer to the heat exchanger at all interconnects and can simply elbow up to the heat exchanger at the non-IP end of Q3.

Confirming the design choices shown on the LBL drawings "Bill of Materials"--main power bus will be in the lower cold mass port (M1). Trim and corrector leads will be in port M2. Instrumentation will be in port M3 (formerly labelled M4 on 24C2986 and other cross-sections).

Although we presently plan to use three cold mass ports for utilities and the fourth for heat transfer, as described above, it might be possible to put all the instrumentation and corrector leads in one port, thus requiring only two ports for wires and main power bus. Only two cold mass ports would then pass through the Q3/DBFX interconnect; three ports (including the heat transfer port) would pass through other inner triplet interconnects. We will keep this option in mind as we learn more about the space requirements for routing and connecting bus and wires.

Fermilab will confirm bus dimensions for LBL.

The Test Stand-Q3 interconnect shall be used as far as possible in the DFBX-Q3 interconnect.

The inner triplets for IR2 and IR8 will include 4.5 K thermal intercepts, as well as at IR1 and IR5.

D1 to DFBX interface.

LBL will relocate pipes C1' and C2' on drawings 24C3236 and 24C3246.

LBL will make the following changes on drawing 24C3236: line CY moves toward the previous C1' and C2' location, and line LD is renamed CL. The precise CY line location depends on some D1 heat exchanger and phase separator termination details which are not yet fixed. *BNL will resolve the general phase separator and heat exchanger schematic for making the "uphill" and "downhill" D1's the same.*

BNL will check on the quench heater wire size, which is presently called out as 14 AWG. It might be a smaller size, like 18 AWG, instead.

The connection to D1 will include a RHIC-style sliding bellows joint for the main cold mass and bus connection.

In a right-side D1, line XB is 2 1/2 inch tube. In a left-side D1, XB is 2 1/2 IPS pipe. This difference results from the use of existing RHIC cryostat piping.

The open distance between DFBX and D1 shall be approximately 660 mm if possible, to allow the use of a single-piece vacuum vessel closure.

The charge to the committee and agenda are attached below.

LHC INNERTRIPLET FEEDBOX INTERFACE REVIEW

Monday 28 June 1999
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This review is one of two focused on the interface specification for the LHC Inner Triplet Feedboxes (DFBX) being developed by LBNL as part of the US LHC Accelerator Project. These two review will satisfy a level 3 milestone calling for a review of the interface specifications. This review addresses principally the interfaces between US provided equipment, that is the interfaces of the DFBX to the inner triplet quadrupole Q3 and to the superconducting beam separation dipole D1 at points 2 and 8. The second review will take place at CERN on 28 July and it will address the remaining interfaces, which are principally with CERN equipment.

The review committee consists of Tom Peterson, Fermilab (chair), Mike Lamm, Fermilab, Tom Nicol, Fermilab, Steve Plate, BNL, and KC Wu, BNL.

The charge to the review committee is the following:

> This review is to examine the draft interface specifications and associated drawings for the DFBX. In this meeting the emphasis will be on the interfaces to the D1 and the Q3, but the reviewers are welcome to comment on other interfaces if time permits. The primary goal of this review is to cause discussion to occur resulting in comments and recommendations that can be used to create the version of the DFBX Interface Specification which will be submitted to CERN for final approval.

Copies of draft interface drawings can be found at the following website:

> http://supercon.lbl.gov/zbasnik/lhc/

LHC INNERTRIPLET FEEDBOX INTERFACE REVIEW
DRAFT AGENDA

Date: Monday, June 28, 1999

Time: 09:00 to 15:00

Place: LBNL, B71 Conference Room

Meeting goal/purpose (in approximate order of priority):

1. Introduce and review DFBX Interface Specification Structure
2. Review details of DFBX Interfaces between US components
3. Provide input for refining the DFBX Interfaces between US components
4. Review Preliminary DFBX Interfaces with CERN components
5. Provide input for refining DFBX Interfaces with CERN components

Agenda:

0900 to 0930	Discussion of Interface Specification Format
0930 to 1030	Discussion of Mechanical Interfaces between DFBX and Q3 (verify cross-sectional features and positions and discuss longitudinal interconnect plane)
1030 to 1130	Discussion of Electrical Interfaces between DFBX and Q3 (verify cross-sectional features and positions and discuss longitudinal features)
1130 to 1200	Wrap-up of Q3 Mechanical and Electrical Interfaces (Tom Peterson and Mike Lamm to make preliminary list or recommendations and action items)
1200 to 1300	Lunch (on your own in the cafeteria)
1300 to 1330	Discussion of Mechanical Interfaces between DFBX and D1 (verify cross-sectional features and positions and discuss longitudinal interconnect plane)
1330 to 1400	Discussion of Electrical Interfaces between DFBX and D1 (verify cross-sectional features and positions and discuss longitudinal features)
1400 to 1430	Wrap-up of D1 Mechanical and Electrical Interfaces (Tom Peterson and Mike Lamm to make preliminary list or recommendations and action items)
1430	Adjourn